Prepared for:
U.S. Environmental Protection Agency
Region 7
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Final
Mine Waste Remediation

Madison County Mines Site OU5

Field Sampling Plan

Madison County, Missouri

September 2014

EPA Contract No.: EP-S7-05-06
EPA Task Order No.: 0126
BVSPC Project No.: 044799

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Table of Contents

1.0 Introduction

The Madison County Mines Site, Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) identification number MOD098633415, is located near Fredericktown in southeastern Missouri. The Site is located at the southern end of the Old Lead Belt where heavy metal mining has occurred since the early 1700s.

The Site is located about 80 miles south of St. Louis, Missouri, on the southeastern edge of the Ozark Uplift. Past mining operations have left at least 13 identified major mine waste areas, in the form of tailings and chat deposits, from smelting and mineral processing operations in Madison County. Chat deposits include sand to gravel sized material resulting from the crushing, grinding, and dry separation of the ore material. Tailings deposits include sand and silt sized material resulting from the wet washing or floatation separation of the ore material. The mine waste contains elevated levels of lead and other heavy metals which pose a threat to human health and the environment. The limit of disturbance for the entire Site, Operable Unit 5 (OU5), is approximately 60 acres.

This plan has been prepared to provide guidance for the confirmation sampling that will be required to be performed by the contractor as part of the OU5 Remedial Action for the Site. The sampling covered by this plan shall be used to ensure that contaminated materials above the action levels for the project have been removed.

2.0 Objectives

The objective of the OU5 remedial action field sampling effort is to ensure that the excavation of the Site has removed all soil material with contaminant levels above the action levels for the Site. Because there are no federal or state cleanup standards for soil contamination, the Environmental Protection Agency (EPA) established the stated cleanup levels based on information in the Baseline Human Health Risk Assessment (BHHRA) and Ecological Risk Assessment (ERA). Cleanup levels were selected (based on preliminary remediation goals, or PRGs) that would both reduce the risk associated with human and ecological exposure to soil contaminants, primarily lead, to an acceptable level and ensure minimal migration of contaminants into the groundwater. The Record of Decision (ROD) identified the action levels for Operable Unit 05 to be the following:

- **Cleanup levels for mine waste – Consolidation and capping**
  - Arsenic: 180 parts per million (ppm)(mg/kg)
  - Cobalt: 130 ppm
  - Lead: 1,460 ppm
  - Manganese: 2,200 ppm
  - Nickel: 380 ppm

A determination will be made through 10 percent comparative analyses during the design phase to confirm historic evidence that achieving the cleanup standard for lead in soil will accomplish meeting the cleanup levels for the other chemicals of concern (COCs) including arsenic, cobalt, manganese and nickel.

- **Cleanup level for soil – excavation**
  - Lead in residential soil: 400 ppm
  - Lead in recreational soil: 1,250 ppm

Other COCs besides lead present in soil most often coexist with lead contamination. The cleanup levels are expected to be met when the lead concentrations are reduced. A comparative analysis will be incorporated in the remedial design using 10 percent of the samples collected for laboratory analysis to confirm the respective cleanup levels are met.

- **Cleanup level for floodplain soil – excavation**
  - Lead: 400 ppm

- **Cleanup levels for sediment – removal**
    - Lead: 150 ppm

Copper and manganese present in the floodplain soil and sediment are predicted to coexist with lead and are projected to be reduced to within their stated cleanup-level concentrations when the lead cleanup level is met. A comparative analysis will be incorporated in the remedial design using 10 percent of the samples analyzed by a laboratory to confirm the respective cleanup levels are met.

- **Cleanup levels for surface water**

Cleanup levels for surface water are not established since the overall exposure is negligible compared to the presence of COCs in sediment and floodplain soils. Surface runoff will be controlled through the engineering design of the cap to prevent future deposition of contamination to ditches, tributaries and streams. The removal of floodplain soils will further enhance surface water quality and will be monitored to-confirm MNR is achieved.

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- **Cleanup levels for groundwater**

Cleanup levels for shallow groundwater are not established as numeric values since shallow, perched groundwater contamination is only documented to exist in the waste piles. The RAO for groundwater relates to decreasing the volume of precipitation water infiltrating the waste piles. The reduction of precipitation water percolating into the waste piles will further minimize hydraulic mounding preventing groundwater discharges or seeps to the-surface at the sides and base of the capped areas. Consumption of groundwater will be prevented through environmental covenants with property owners under Missouri Environmental Covenants Act (MoECA) by preventing drilling of wells arid potable use of groundwater. Shallow groundwater will be monitored to ensure irrigation outside the waste piles is not occurring.

Samples shall be collected at a minimum rate of 1 sample per 10,000 square feet (sf) and as detailed in Section 4 of this plan.

Should this field sampling effort indicate that any areas still contain contaminants above the action levels, then additional excavation will be required in that sample cell.

Additional sampling will be conducted with subsequent excavation until sampling shows that the contaminant levels are below the action levels.

3.0 Previous Sampling Effort

The most recent sampling event was conducted for the Site in February 2014 to estimate the depth of the contaminants and approximate the excavation that will be required to remediate the Site. The remedial action design was based on this sampling event.

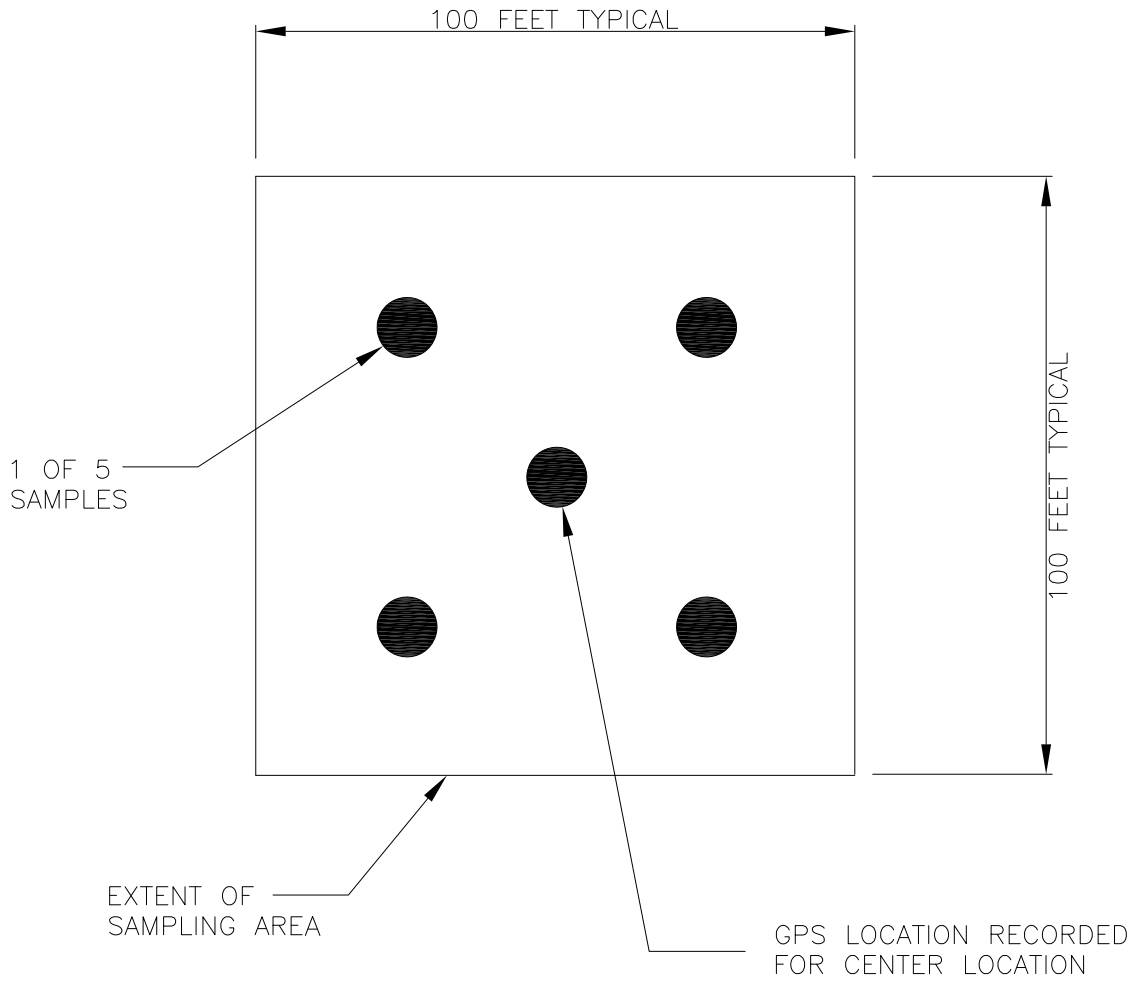
As part of the sampling, perimeter surface sampling, floodplain sampling, and test pit sampling were conducted. The results of this sampling event can be found at the end of the OU5 Remedial Action Contract Specifications.

4.0 Sampling Locations

Consistent with the EPA Handbook (EPA, 2003), all samples will be 5-point (also termed 5-aliquot) composite surface soil samples, as shown on Figure 4-1, that will be collected from *Sample Cells* not larger than 100 ft by 100 ft (10,000 square feet).

One 5-point composite sample will be collected from each 100 ft by 100 ft grid. One 5-point composite sample will be collected from perimeter grids that contain at least 2,500 square feet. Samples shall be collected in accordance with the procedures listed in Section 5.

The sample cells will be determined by the contractor by overlaying a 100 ft square grid over the project site. The contractor may alter the sample cell locations to coincide with the actual progress of work. While sample cell locations may change, the sample cell size shall be a maximum of 10,000 sf. The contractor shall provide survey documentation of the center of the sample cell to demonstrate that adequate field sampling has been performed to ensure the remedial action excavation has removed the soils with contaminant levels above the action levels for the project.



NOTES:
- ALL DIMENSIONS ARE APPROXIMATE.
- FIGURE NOT TO SCALE.
- ALL COMPOSITE SUBSAMPLE ALIQUOTS SHALL BE THOROUGHLY MIXED.

FIGURE

4-1

COMPOSITE SAMPLE

MADISON COUNTY
MINES SITE OU5
EPA REGION 7

MADISON COUNTY MISSOURI

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Building a world of difference.
200 BELLVUE PARKWAY, SUITE 215
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5.0 Sampling Procedures

Sampling procedures for the Madison County Mines Site OU5 Remedial Action are discussed below. The samples will be collected from each sample cell that contains a maximum area of 10,000 sf and a minimum area of 2,500 sf. Sampling personnel will use a hand-held GPS unit to find the coordinate associated with each sample cell and collect the 5-aliquot composite surface soil sample. The exact location and layout of the samples shall be determined by the contractor and shall be coordinated with the contractor's work plan and construction schedule.

- Field crews will attempt to collect the five aliquot samples as shown in Figure 4-1. However, if a sample location is close to dense woods with heavy undergrowth, a paved area, a structure or body of water, the field crew will adjust the shape of the sample cell. The adjusted five-aliquot composite sample will be collected from within a 2,500 to 10,000 sf area that will be depicted or described in the field notebook.

- The sampling team will prepare field work sheets, including notes and sketches of sampling locations.

- Location coordinates will be obtained with a hand-held GPS unit capable of sub-meter accuracy. The coordinates for each sample location will be recorded.

- Samples shall be analyzed using X-ray fluorescence (XRF) or laboratory ICP using EPA method 6010.

- Quality Assurance:

    a. Sieves and stainless steel spoons and pans used to prepare samples for XRF analysis will be thoroughly decontaminated after each use. Equipment rinsate blanks, which are used to determine the effectiveness of the equipment decontamination, will not be collected.

- Each sample will be identified with a discrete sample number corresponding to the grid number from the collection location and identified on a sampling location map.

The following procedures will be used when collecting and analyzing surface soil samples:

1. Document the location where the sample is being collected, the date, the time and the weather conditions in the field logbook and on the field sheets. Describe the sample collection location, including hand sketches and measurements, if necessary.
2. Don a clean pair of nitrile gloves.
3. Using a clean, dry, stainless steel hand trowel or spoon, collect five aliquots from the upper 1-inch of soil. Collect approximately 50 grams of soil at each aliquot location into one Ziploc® bag or approved equivalent (storage bag). Transfer the soil from the storage bag into a No. 10 (2mm) sieve. Remove vegetation and rocks from the soil sample. Sieve the soil into a stainless steel pan.
4. After sieving the sample shall be thoroughly homogenized and then transferred to a clean labeled bag for analysis.
5. Use a soil moisture meter to collect a moisture reading from the soil in the bag.
6. If soil moisture is 20% or less, proceed to step 7. If soil moisture is greater than 20%, analyze the sample with the XRF using the procedure in Step 7, then air dry the sample on clean plastic sheeting until the moisture content is 20% or less. Then reanalyze with the XRF using the procedure in Step 7. Both readings will be recorded. If a significant difference is detected (a relative percent difference greater than 20%), the results from the dried sample will be used otherwise the original sample results shall be used.
    a. The 20 percent value was selected because Section 4.3 of EPA Method 6200, *Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment*, indicates that when the moisture content is between 5 and 20 percent, the overall error form moisture may be minimal.
7. Samples will be analyzed using an XRF unit in soil test mode.
8. All sampling equipment used for collection shall be thoroughly decontaminated between samples. This shall be accomplished by removal of soil material from the equipment with a paper towel, followed by detergent wash, then clean water rinse.

9. The XRF and GPS data will be compiled by the contractor and submitted to the EPA Project Manager. A summary of the data, specifically listing the number and location of any tests that had results higher than the action levels for the site, shall be submitted with the test data.

6.0 References

EPA, 2003. U.S. Environmental Protection Agency. Superfund Lead-Contaminated Residential Sites Handbook. OSWER 9285.7-50. August, 2003

EPA, 2012. United States Environmental Protection Agency, *Record of Decision, Catherine Mines and Skaggs Tailings Subsites, Operable Unit 05.* Prepared by USEPA, Region 7, September 27, 2012.